Amendments to the Drawings:

Included in the amendment are an "Annotated Sheet Showing Changes" and a "Replacement Sheet" for Fig. 1. In FIG. 1 as originally filed, the signal path between the coefficient storage unit 13 and the coefficient generator 10 has no direction of signal flow indicated. This direction is hereby added for completeness. Support for this change can be found in the present invention page 4, paragraph [0013] which indicates "by applying tap coefficients c_0, c_1, c_2... c_{m-1} (collectively $c_{k,n}$, and indicated by coefficient storage unit 13 in FIG. 1) received from coefficient generator 10" indicating the direction of signal flow is toward the coefficient storage unit 13.

In FIG. 1, the signal path output from data register 2 labeled as $x_0 \ldots x_{M-1}$ is missing an arrow at an input to the coefficient error estimator 6. "The estimator 6 multiplies the adjusted error with each of the data samples x_n in order to generate and output one or more tap coefficient error estimates ("estimated error")." See present invention page 6, paragraph [0020].

Typos for subscripts in FIG. 1 are also corrected for x_{M-1} output of data register 2, $y=\Sigma c_{k,n} x_n$ on line 100, and $c_{k,n}$ in coefficient storage unit 13.

Remarks

The present amendment responds to the Office Action dated November 18, 2004. That Office Action was addressed to an attorney who had been relieved of responsibility for the case. It was not received by the assignee or an attorney having responsibility for prosecution of the case. Upon learning that the case had become abandoned, a petition to revive was promptly prepared and accompanies this amendment. Claims 1-7 and 10-16 were rejected under 35 U.S.C. §102(b) based on Hirano U.S. Patent No. 5,608,804 (Hirano). Claims 8, 9, and 17 were rejected under 35 U.S.C. §103(a) based on Hirano. These grounds of rejection are addressed below following a brief discussion of the present invention to provide context. Claims 1, 5, 10, and 14 have been amended to be more clear and distinct. A new claim 18 has been added. Claims 1-18 are presently pending.

The Present Invention

The present invention is directed toward blind adaptive equalizers that use a dot product of tap coefficients and input data samples to generate an output of the blind adaptive equalizer. A blind adaptive equalizer has a convergence time that depends upon how efficiently the tap coefficients are adjusted in order to quickly converge its output to minimize errors. In order to adjust the tap coefficients, an equalizer output error signal is determined that represents how close the output is to convergence. The equalizer output error signal is generated by subtracting a blind reference signal from the blind equalizer output. See, for example, FIG. 1 and page 5, paragraphs [0016] and [0017] of the present invention. An adjusted equalizer error is determined

by multiplying the equalizer output error signal with an adjustment factor. Tap coefficient error estimates are then generated in a coefficient error estimator by multiplying the adjusted equalizer error with the input data samples "in order to generate and output one or more tap coefficient error estimates". The tap coefficient error estimates are then sent to a tracking generator. See, FIG. 1 and page 6, paragraph [0020], for example. The tracking generator uses a smoothing filter to receive a tap coefficient error estimate of a data stream and generates a smoothed error from the estimate on a sampling period basis. A tracking unit is then used to generate a fractional error from the smoothed error. The fractional error is used by a tap coefficient generator to adjust a tap coefficient whereby the blind adaptive equalizer achieves an improved convergence time. Fig. 1 and page 8, paragraph [0026], and page 9, paragraphs [0028] and [0029].

The Art Rejections

As addressed in greater detail below, Hirano does not support the Examiner's reading of it and the rejections based thereupon should be reconsidered and withdrawn. Further, the Applicant does not acquiesce in the analysis of Hirano made by the Examiner and respectfully traverses the Examiner's analysis underlying its rejections.

The Examiner rejected claims 1-7 and 10-16 under 35 U.S.C. §102(b) based on Hirano. Hirano describes a method and apparatus for identifying characteristics of an unknown system by adjusting coefficients of an adaptive filter primarily based on a power level estimate of an input signal. Hirano generates coefficient adjustments in various step sizes. A step size is related to the input signal power by a function that increases the step size as the input signal power

increases until a threshold is reached at which point the step size decreases with further increases in the input signal power. Hirano, Fig. 4, col. 10, lines 10-52. The relationship of the step size to the input signal power may be affected by a noise level estimate of an error signal.

Hirano determines the error signal by subtracting an adaptive filter output from an unknown system output. Hirano, Fig. 8, and col. 12, lines 46-50. In one embodiment of Hirano as shown in Fig. 10, a noise level estimating circuit 300 generates the noise level estimate 305 in a noise level calculating circuit. Hirano, Fig. 10 and col. 13, lines 21-44. In Fig. 11 of Hirano, a noise level calculating circuit 400 is shown in which a noise level that is to be stored in register 408 is selected to be either a nonlinear conversion of the error signal scaled by a constant and combined with a scaled version of the stored noise level or the previous contents of the register 408. The selection choice is based on a comparator, such as comparator 302 of Fig. 10 in Hirano, which determines whether the adaptive filter output 5 exceeds a threshold or not. Hirano, col. 13, lines 45-67. The noise level estimate 305 of the error signal that is generated affects the step size used to adjust the filter coefficients.

In contrast, the present invention generates an equalizer error output by subtracting a blind reference signal from a blind equalizer output. The blind reference signal may be a fixed reference or derived from a fixed reference and is not an unknown system output as in Hirano. The error signal in the present invention is a measure of convergence and is not used for the purposes of measuring a noise level as it is in Hirano. See the present invention page 5 paragraph [0017]. Also, see Hirano, col. 2, lines 24-57.

Also in contrast with Hirano, the present invention generates tap coefficient error estimates that are a product of the input data samples and an adjusted equalizer error, where the adjusted equalizer error is a scaled measure of convergence. Present invention page 6, paragraph [0020]. The tap coefficient error estimates of the present invention are not based on a level of the filter output as described in Hirano where a noise level estimate is updated dependent upon the filter output. Hirano has no equivalent approach to using input data samples in the generation of a fractional error. Rather, Hirano uses a noise level estimate of an error signal to determine an input power threshold for increasing or decreasing a step size. Hirano, col. 12, lines 50-64.

Further, a step size determining circuit in Hirano receives a power estimate of an adaptive filter input signal and a signal indicative of the noise level of an error signal. In contrast, the coefficient generator of the present invention adjusts existing coefficients based on fractional errors that are scaled smoothed tap coefficient error estimates. The step size in Hirano is not based on a scaled smoothed measure of convergence of a blind adaptive equalizer.

The Examiner rejected claims 8, 9, and 17 under 35 U.S.C. §103(a) based on Hirano in view of obviousness to one skilled in the art. Claims 8 and 17 claim an enabling value of 1/256 for a coefficient adjustment factor. Claim 9 claims that the tracking generator comprises a programmed medium. Stating that these claims are "rather design specific" is not a sufficient basis for establishing obviousness. See MPEP Section 2143. If this rejection is maintained after the present response, clarification is requested.

In summary, Hirano does not indicate a recognition of the problems addressed by the present invention. Further, Hirano does not teach and does not suggest an apparatus which

would solve the problems of improving the convergence time in blind adaptive equalizers addressed by the present invention in the manner solved by the present invention as presently claimed. The claims as presently amended are not taught, are not inherent, and are not obvious in light of the relied upon art.

Conclusion

All of the presently pending claims, as amended, appearing to define over the applied references, withdrawal of the present rejection and prompt allowance are requested.

Respectfully submitted,

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Annotated Sheet Showing Changes

FIG. 1